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The humpback whales of Glacier Bay and adjacent waters:

Summer 1985

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Abstract

A total of 41 individual whales were identified in the combined areas of Glacier Bay and Icy Strait across the entire summer; 15 in Glacier Bay, 30 in Icy Strait, and 4 common to both. Six whales were resident in Glacier Bay for periods of at least three to four weeks each. Eleven adults and a calf were resident near Point Adolphus for nearly the entire summer study. Peak numbers of whales were found in early July and abundance declined only slightly throughout August. Five whales first sighted in Glacier Bay or Icy Strait were later sighted in Frederick Sound. The feeding behavior and distribution of whales in Glacier Bay followed three month-long trends that were related to changes in prey abundance and idiosyncratic habits of resident whales. Whales in Glacier Bay were generally solitary. At Point Adolphus a cooperatively-feeding pod of seven adults and a calf fed on schooling herring throughout the summer.

Introduction

In the years prior to 1978, as many as 24 whales entered Glacier Bay and remained there to feed for a substantial part of the summer. In 1978, however, 17 of the 20 whales that entered the bay abruptly departed soon after their entry. Two hypotheses were advanced to explain this sudden departure. The first asserted that vessel traffic disturbed the behavior of whales and that the exponential increase of vessel traffic in Glacier Bay during the years prior to and including 1978 forced the whales to "abandon" the bay. The second hypothesis proposed that the whales' departure was the result of a natural decline in the availability of their prey within Glacier Bay.

In 1981 the National Park Service, with the assistance of the National Marine Mammal Laboratory, initiated a multidisciplinary study of the behavior of humpback whales (Baker et al. 1982; Baker et al. 1983; Dean et al. 1985), the distribution of their prey, (Wing and Krieger 1983; Krieger and Wing 1984), and their acoustic environment (Malme, Miles, and McElroy 1982; Miles and Malme 1983). While these studies have corroborated some aspects of both hypotheses, they have not yet conclusively demonstrated the reasons for the whales' departure from the bay in 1978. Nonetheless, the studies initiated and funded by the National Park Service have begun to answer many questions concerning the behavior, distribution, abundance, and ecology of humpback whales in Glacier Bay and throughout southeastern Alaska (Baker et al. 1985). It seems certain that much of the data collected during these studies will be of long-term value to the management of humpback whales not only in southeastern Alaska, but throughout their range.

In this report I summarize the results of the Glacier Bay National Park's ongoing monitoring of humpback whale abundance, movement, social behavior, and

feeding in Glacier Bay and Icy Strait during the 1985 summer seasons. Where available, data from earlier work in the bay and other regions are integrated into these findings.

Methods

Vessel Surveys

I observed and photographed humpback whales from a 17-foot Boston Whaler powered by a 50-hp Johnson outboard motor. Surveys for whales in Glacier Bay usually included the entire lower and mid-bay to Sturgess Island or Geike Inlet. Several of the surveys reached as far into the east arm as Point George and as far into the west arm as Blue Mouse Cove and Tidal Inlet. Surveys for whales in Icy Strait were generally confined to the waters just outside of the bay's mouth and the coastline a few miles east and west of Point Adolphus on Chichagof Island. One survey of Icy Strait also included the mouth of Excursion Inlet and Icy Passage.

Humpback whale surveys in Glacier Bay were conducted on ten days during June, 11 days during July, and ten days in August, 1985 (Table 1). These 31 surveys averaged 7.5 hours in duration each and included a total of 234 hours on the water. Surveys in Icy Strait were conducted on seven days in June, four days in July, three days in August, and one day in early September, 1985 (Table 2). These fifteen surveys averaged 6.1 hours each and included a total of 92 hours on the water. The number of surveys in each area was limited to two or three a week to minimize any possible impact that the monitoring program might have on the whales.

In addition to the surveys of Glacier Bay and Icy Strait, I was able to complete, with the cooperation of the Auke Bay Laboratory of the National Marine Fisheries Service, three surveys of Frederick Sound and Stephens

Passage. In recent years, there has been a pattern of late-summer movement of whales into this region from Glacier Bay and Icy Strait (Baker et al. 1983; Baker 1984; Baker et al. 1985; Perry et al. 1985). One of the goals of these surveys was to continue documentation of this seasonal trend in regional movement. Another goal of these surveys was to continue assessment of humpback whale populations in areas of southeastern Alaska that may be impacted indirectly by vessel activity in Glacier Bay National Park. The Park Service's continued monitoring of the southeastern population was strongly recommended by the 1984 biological opinion of the National Marine Fisheries Service (Federal Register 1984).

Photo-Identification

Photographs were taken with a Canon A1 camera equipped with a motor-drive and a 70 to 205-mm zoom or a 300-mm telephoto lens. High speed (400 ASA) film was used. In all cases I attempted to obtain clear photographs of the dorsal fin and the ventral surface of each whale's tail flukes for the purposes of individual identification (Katona et al. 1979). These individual identification photographs were then compared to available photographs (Perry et al. 1985) to determine the past sighting history of each whale. Individual whales are referred to by an identification number from the Kewalo Basin Marine Mammal Laboratory catalog. Individuals previously identified by Jurasz and Palmer (1981) are also cross-referenced to their previously assigned nicknames. Further details of the photo-identification methods can be found in Perry et al. (1985) and Baker et al. (1985). Whales not known to have been previously photo-identified are designated by a code referring to the year, area, and sequence of their sighting. For example, 85-PA-02 was the second

previously unidentified whale sighted at Point Adolphus this summer.

Prey Assessment

Humpback whale prey was qualitatively assessed with a Ross Fineline 250-C, recording fathometer equipped with a 22-degree beam, 100-kHz transducer. This frequency transducer was chosen, based on consultation with Ken Krieger of the Auke Bay Laboratory, NMFS, in order to allow the discrimination of both fish and planktonic targets in the upper 150 m of water. Qualitative assessment of humpback whale prey included standardized transects followed those of Wing and Krieger (1982) and Krieger and Wing (1983), as well as opportunistic assessment in the immediate vicinity of feeding whales.

Quantitative assessment of humpback whale prey was restricted to two surveys conducted on adjacent days (August 8 and 9). The quantitative assessment was conducted from the R/V SEARCHER by Ken Krieger using methods and equipment comparable to those used in previous years (Wing and Krieger 1982; Krieger and Wing 1983). The chart recordings from the Ross fathometer were also sent to Ken Krieger and he has agreed to provide a short evaluation of the three qualitative surveys as part of his report. As a consequence, this report will not include comment or discussion of the prey assessment surveys.

Results

Abundance

Glacier Bay. There were 51 sightings of humpback whales during the 31 summer surveys (Table 1). From these 51 sightings, a total of 15 individual whales were identified (Table 3). All sighted whales were individually identified. Restricting the photo-identification sample to the months of July and August, a period comparable to the sampling period in earlier years, would

result in only 10 whales being counted. However, the number of surveys during July and August was considerably less than in the comparable sampling period from previous years (Perry et al. 1985). Thus it may be more valid to consider the entire summer sample when comparing the 1985 abundance to previous years.

Icy Strait. There were 141 sightings of humpback whales in Icy Strait during the 15 summer surveys (Table 2). From these sightings, a total of 30 whales were individually identified (Table 4). All sighted whales were individually identified. Restricting the photo-identification sample to the months of July and August would result in 19 whales being counted.

Seasonal Influx

Glacier Bay. The number of whales identified in the bay increased slowly during June and the peak number of whales, four, was identified on July 9 (Table 1). On the assumption that resident whales were continuously present between sightings, there were an additional three (a total of seven) individuals in the bay on this date. The number of whales dropped to approximately four or five in mid-July and remained fairly constant until the end of August.

Icy Strait. The seasonal influx at Point Adolphus was similar to that in the bay. Again assuming that resident whales were present continuously between sightings, the number of whales increased during early June with as many as 13 whales present by June 15. This number remained fairly constant throughout the remainder of June and July with the peak, 15 whales, on July 11. Abundance declined slowly throughout August and at least seven whales remained on September 3.

Local Movement and Residency

Four whales sighted near Point Adolphus were also sighted in Glacier Bay at some time during the summer: Chop Suey (#118), Leigh (#236), #221, and #351. Two animals were documented to have traveled from Point Adolphus to Glacier Bay and back to Point Adolphus. Chop Suey was first sighted at Point Adolphus in early June and then moved into the bay where he remained for nearly three months. He was last sighted in the bay on August 23 and subsequently sighted at Point Adolphus on September 4. Leigh was sighted first near Point Adolphus, then moved into the bay for a period of only a few days before returning to Point Adolphus for the rest of the summer. Animal #221 was sighted at Point Adolphus on July 11, then seen leaving the bay on July 14. Animal #221 was not sighted subsequently. Only animal #351, was documented traveling from Glacier Bay to Point Adolphus and back to the bay (Table 3 and 4).

Given the infrequency of movement back and forth between Icy Strait and Glacier Bay, determining residency in either area was straightforward. Residency is defined here as continuous occupancy of an area for a minimum period of approximately four weeks (Baker et al. 1983; Perry et al. 1985). Based on observations across the entire summer season, five whales could be considered resident in Glacier Bay: #281, Chop Suey, #351, White Eyes (#117), and 85-GB-03. A sixth, animal 85-GB-02, appeared to have remained in the bay for at least three weeks and may also have qualified as a resident. If the sampling period is restricted to the months of July and August, only four whales could be considered resident.

At Point Adolphus, 11 adults and one calf were resident for nearly the entire summer. Restricting the sampling period to July and August would not affect this number.

Regional Movement

A preliminary analysis of photographs collected in Stephens Passage and Frederick Sound has already documented a few cases of regional movement from Glacier Bay and Icy Strait (Table 5). One animal, #281, resident in Glacier Bay during June, was sighted in Frederick Sound on July 11. A cow, #155, and her calf, resident at Point Adolphus from mid June to early August, were sighted in Seymour Canal on August 30. Another resident from Point Adolphus, 85-GB-02, was last sighted there on July 24 and next sighted in Frederick Sound on August 5. At least two other whales, #043 and #221, initially sighted in Glacier Bay or at Point Adolphus, were later sighted in Frederick Sound.

Distribution

Glacier Bay. The majority of whale sightings during June were in the entrance to Muir Inlet from Sebree Island across to Garforth and up to Point George (Figure 1). There were very few sightings of whales in the lower and mid-bay. In early June Chop Suey was sighted several times in Beardslee Entrance but later moved north to Garforth Island and the entrance to Muir Inlet. Other whales seen frequently in the entrance to Muir Inlet included White Eyes, #281 and 85-GB-02; the latter two whales have not been previously identified in Glacier Bay. Leigh was seen twice in the mid bay.

During July the distribution of whale sightings shifted to the West Arm, particularly to the area between Lone Island and Blue Mouse Cove. The majority of sightings in the West Arm were accounted for by three animals; White Eyes, #351, and ^{#801}85-GB-03. A few whales continued to occasion the area near Sebree Island and Garforth Island and sightings in the lower and mid bay continued to be infrequent. One whale, #381, was seen in Sitakaday Narrows traveling north. A second whale, #221, was seen traveling south along the west shore of

Sitakaday Narrows and was not resighted in the bay. White Eyes moved into the lower bay towards the middle of July and apparently left the bay shortly thereafter.

In August the whales left the upper bay and were seen most frequently in the mid and lower bay. Chop Suey and #159 were sighted near Flapjack and Willoughby Islands as well as along the coast of Young and Lester Islands. One animal, ^{#801}85-GB-03, was sighted in Tyndall Cove of Geike Inlet as well as near the north tip of Willoughby Island.

Icy Strait. The whales sighted in Icy Strait were concentrated in an area a few kilometers to the east and west of Point Adolphus and within approximately two kilometers of shore (Figures 1, 2, and 3).

Prey Assessment and Feeding Behavior

Glacier Bay. Feeding behavior and prey type seemed to fall into three fairly distinct month-long phases. During June, the whales in the mouth of Muir Inlet were observed feeding at the surface and near the surface. Although fathometer recordings were not available during June there was good circumstantial evidence that whales in the Muir Inlet area were feeding primarily on schooling fish. Salmon trollers operating near Garforth Island and Muir Point commented on the "cucumber" and needle fish in the stomachs of the salmon (probably capelin and sandlance). Gulls were observed feeding with the whales during several sightings. Some of the whales sighted were foraging very near shore where small schools of fish are often found. Finally, when the whales were lunge feeding, the lunges were vigorous but intermittent and no bubbling was observed. Whales lunge feeding on euphausiids often bubble and are usually languid in their movement and lunge several times in sequence.

In July, the majority of whales were observed feeding at or near the

surface in the mouth of the West Arm. The feeding behavior of whales and the fathometer recordings made in their paths indicated that the primary prey was euphausiids. On the evening of July 7, for example, I observed Notchfin (#232) surface feeding about 3 km south of Hugh Miller Inlet. At about 20:05, her dives were short, 45 to 60 sec in duration, and her lateral-lunge surfacings were preceded by a single, large burst of bubbles approximately 2 m in diameter. I have not previously seen this type of "bubble-burst" feeding in the bay but it is not unusual in Frederick Sound when whales are lunge feeding on euphausiids. Fathometer recordings in the proximity of Notchfin showed dense traces of euphausiids at and near the surface in 100 m of water (Figure 4). As Notchfin moved out of the concentration of near-surface euphausiids at about 20:15, she stopped surface feeding. At 20:25 she fluked up and dived over a dense layer of euphausiids centered at about 60 m. A few minutes later she moved into another surface layer of euphausiids and began lunge feeding again.

Although the majority of whale activity was centered in the mouth of the West Arm during July, there was some intermittent feeding by a few whales in the lower bay. On the afternoon of July 17, White Eyes was surface feeding in the mid-channel of Sitakaday Narrows. His feeding activity was restricted to tidal whirlpools which seemed to concentrate the forage in dense trellises extending from about 20 to 60 m in depth (Figure 5). Net sampling of similar trellises in 1984 revealed a rich mixture of both schooling fish and euphausiids forming a kind of whale "trail mix". As the tide slackened the tidal whirlpools disappeared, the forage dispersed and White Eyes moved out of the area.

A similar relationship between tidal activity and feeding behavior was observed on the afternoon of July 21. At 15:28, Chop Suey was "browsing" at

the entrance to Berg Bay. Fathometer recordings show a dense trace of prey (probably schooling fish) in the tidal rip at the shallow lip of the bay (Figure 6). Chop Suey moved on into the bay and after making a large circle along the shore, returned to the entrance and left at 16:40. In contrast to his behavior on entering the bay, he did not pause at the entrance to browse. At this time, the tidal rips had disappeared and the prey was dispersed.

In August, the predominant feeding behavior was near-shore browsing in the lower bay. In most of the August observations, the prey appeared to be schooling fish. On August 12, 85-GB-03 was near-surface feeding in Tyndall Cove of Geike Inlet. The whale was swimming rapidly in a broad zig-zag as it moved out of the Tyndall Cove and east toward Shag Cove. The rapid and erratic movement of the whale suggested that the prey was schooling fish. Fathometer recordings made in Tyndall Cove on the following day showed isolated balls of schooling fish. On August 25, 85-GB-03^{#86)} was intermittently surface-lunge feeding near the north tip of Willoughby Island. As in the previous observation, the whale's movement was rapid and erratic between the intermittent bouts of surface lunging. Fathometer recordings in the path of the whale again showed isolated balls of schooling fish near the surface and at a depth of about 60 to 80 m (Figure 7).

Point Adolphus. As in previous years (Baker 1984; Baker et al. 1983; Krieger and Wing 1984), all the whales at Point Adolphus were engaged in sub-surface feeding. Fathometer recordings made in the whales' paths showed dense schools of fish, sometimes as much as 60 m in vertical extent (Figure 8). Previous net sampling at Point Adolphus has shown that these schooling fish are predominantly adult herring (Krieger and Wing 1984).

Social Behavior

Glacier Bay. Whales in Glacier Bay were generally solitary. Of the 42 pods encountered, 35 were singletons (for convenience single whales are considered a pod), 6 were pairs and only one was a trio. The only repeated associations observed were between White Eyes and #281 which were observed together on June 24, 26, and 28.

Icy Strait. Most whales near Point Adolphus were gregarious and formed associations that remained stable throughout the summer. The most persistent association was observed between five of the six whales described as the "core group" of whales at Point Adolphus in previous years (Perry et al. 1985): Scooper (#577), Gertrude (#587), Frenchie (#166), Freckle Fluke (#155), and #573. Freckle Fluke was also accompanied by her calf of the year which formed an integral member of the group. This year's core pod was also joined by Leigh and a new whale, 85-GB-02, resulting in a coordinated pod that generally consisted of seven adults and a calf. Only one member of the core group from previous years (Perry et al. 1985), animal #581, generally remained solitary.

Several other animals at Point Adolphus remained almost entirely solitary even when only a few hundred meters from the other whales. The solitary residents included Garfunkle (#516), #530, and MD (#157). MD also paired-up with 85-GB-02 but did not join the core pod. In a few cases, a solitary whale's approach to or confluence with the core group resulted in apparently agonistic behavior followed by the departure of the solitary whale from the immediate area.

Discussion

Abundance

A total of 41 individual whales were individually identified this summer

in the combined areas of Glacier Bay and Icy Strait (15 from Glacier Bay + 30 from Point Adolphus - 4 seen in both areas = 41). Restricting the sampling period to only July and August would result in a combined count of 27 (10 from Glacier Bay + 19 from Point Adolphus - 2 seen in both areas = 27). In either case the conclusion would be unchanged; in comparison to previous years, abundance was low in the bay but high in the adjacent waters of Icy Strait.

Local Movement and Residency

There was little movement back and forth between Glacier Bay and Icy Strait. Many of the whales that came into the bay in the previous three years simply stayed near Point Adolphus. Of the whales that did enter Glacier Bay, a large percentage of them (40%) remained long enough to be considered residents. The number of residents near Point Adolphus was unusually high, 11 adults and one calf remained in an area of about 20-square km for almost three months. This amounts to a home range of only 1.7 km sq per individual whale, an incredibly small area to support an animal weighing perhaps 30 metric tons. Considering that each whale has only a few months in which to gather its food for the entire year, this small home range is even more astounding.

Distribution and Feeding Behavior

The distribution and feeding behavior of whales in Glacier Bay followed three distinct, monthly phases. In early and mid-June, whales concentrated in the mouth of Muir Inlet and were surface and near-surface feeding on what appeared to be on schooling fish. In late June and through to mid-July, whales moved into the West Arm from Lone Island to Blue Mouse Cove and were surface feeding on euphausiids. By late July and for most of August, the whales left the upper bay and were most frequently seen browsing near shore in the lower

bay. The primary prey of the browsing whales again appeared to be schooling fish of unknown species.

Although seasonal changes in prey type and abundance were primary factors affecting the feeding behavior and distribution of whales in the bay and Icy Strait, idiosyncratic differences between whales were also important. For example, Chop Suey was first observed at Point Adolphus in early June, then browsing in the Beardslee Entrance on June 12. He moved up bay to Garforth Island for the latter part of June and early July. He may also have moved farther up the East Arm into Wachussetts Inlet where there were sightings of a whale browsing near shore. Later in July and August he was intermittently seen browsing near shore in the lower bay. He was last seen at Point Adolphus on September 4. As far as I can determine, Chop Suey never moved into the West Arm to feed on euphausiids. On the other hand, animal #351 was first sighted near Hugh Miller Inlet on June 18 and remained in that area while surface feeding on euphausiids throughout July. In early August #351 was sighted at Point Adolphus. Only twice, later in August, was #351 sighted browsing in the lower bay.

Some animals, like #159, seem to arrive in the bay at a specific time of the summer and follow almost identical foraging paths in each year. Differences in the departure timing of whales from Point Adolphus also suggest individual agendas. Thus it seems that idiosyncratic foraging strategies and habits are important considerations in understanding seasonal changes in the distribution and feeding behavior of whales.

Seasonal Influx and Regional Movement

As in the three previous years, the peak abundance of whales in Glacier Bay and Icy Strait occurred in mid-July. Unlike 1984, however, there was no

second influx during August. The surveys of Frederick Sound and Stephens Passage also confirmed that some whales from Glacier Bay and Icy Strait were moving into other regions during the latter part of summer. Baker et al. (1985) suggest that this is part of a complex foraging strategy that takes advantage of seasonal changes in prey type and prey abundance. They suggest that Glacier Bay - Icy Strait has always been primarily an early-summer feeding area. During late summer and early fall, whales from Glacier Bay and other areas of southeastern Alaska tend to congregate in Frederick Sound or Stephens Passage where large concentrations of euphausiids become available.

Social Behavior

The differences in sizes of whale groups in Glacier Bay and at Point Adolphus provides further evidence of the effects of prey type on social organization (Baker and Herman 1984). In Glacier Bay, the predominant feeding strategy in recent years, with the exception of 1982, has been browsing by single whales. In 1982 group feeding on a large school of capelin in Bartlett Cove was the predominant feeding strategy. But in other years fathometer recordings made in the paths of browsing whales show small balls of schooling fish in shallow near-shore water (Krieger and Wing 1984; this report). It seems likely that a single whale is most efficient at encountering and exploiting these small, isolated patches. The near-shore location of much of this prey may also allow the lone whale to herd the small schools against the shore or shallow bottom without the help of other whales.

In contrast to the solitary foraging strategy in Glacier Bay, the continuous association and coordinated behavior of the core group at Point Adolphus indicates a cooperative feeding strategy (Baker and Herman 1984). By foraging as a group and coordinating their behavior, the core group may

increase their chances of herding and containing the fast-swimming schools of herring that are their prey. Like the cooperative hunting tactic of social carnivores such as wolves and lions, cooperative feeding among humpback whales may allow the group members to exploit a rich resource that is inefficiently utilized by solitary whales (Baker in preparation).

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Table 1.
Summary of humpback whale surveys in
Glacier Bay during 1985.

Date	Duration (hours)	Total Whales Sighted

Jun 6	8	2
Jun 10	8	1
Jun 12	8	1
Jun 13	7	1
Jun 16	5	2
Jun 18	10	1
Jun 21	5	1
Jun 24	8	3
Jun 26	9	4
Jun 28	10	3
Jul 1	7	2
Jul 3	8	1
Jul 5	10	2
Jul 7 [#]	10	1
Jul 9	8	2
Jul 14	8	3
Jul 17	7	3
Jul 21	6	2
Jul 22 [#]	10	1
Jul 26	8	1
Jul 31	12	1
Aug 2	2	1
Aug 8	6	1
Aug 9 [#]	8	-
Aug 12	8	2
Aug 17	6	2
Aug 20	6	2
Aug 22	4	2
Aug 23	6	2
Aug 25 [#]	8	1
Aug 26 [#]	8	-

[#] Hydroacoustic surveys.

Table 2.
Summary of humpback whale surveys in
Icy Strait (Point Adolphus) during 1985.

Date	Duration (hours)	Total Whales Sighted

Jun 4	6	6
Jun 7	6	6
Jun 8	8	8
Jun 15	8	11A/1c
Jun 21	5	10A/1c
Jun 27	8	10A/1c
Jun 30	6	9A/1c
Jul 11	7	12A/1c
Jul 15	6	13A/1c
Jul 18	6	8A/1c
Jul 24	6	10A/1c
Aug 2	8	9A/1c
Aug 8*	2	7A/1c
Aug 19	6	5A
Sep 4	4	7A

Table 3.
Resight histories of whales photographed in
Glacier Bay during June to August, 1985.

Name	ID#	June				July			August				
		1	9	17	25	3	11	19	27	4	12	20	28
1.	593		G										
2.	281		G		GGG								
3.	85-GB-02			G		G							
4.	CHOP SUEY	118*		GGG	G		G		G	G		G	G
5.	381			G									
6.	351*				G		G		G			G	
7.	LEIGH	236*				G	G						
8.	WHITE EYES	117			GGG		G	G	G	G	G		
9.	350				GG								
10.	DIKE	237				G							
11.	NOTCHFIN	232					G	G					
12.	85-GB-03	801						G		G		G	
13.	221*								G				
14.	85-GB-04	226									G		
15.	159											G	GG

KEY: G = Glacier Bay

Table 4.
Resight histories of whales photographed near
Point Adolphus during June to August, 1985.

Name	ID#	June				July				August			
		1	9	17	25	3	11	19	27	4	12	20	28
1. GARFUNKLE	516	I	I	I	I	II	I	II	I	I	I	I	I
2. MD	157	I	I	I	I	I	I	I	I	I	I	I	I
3. GERTRUDE	587	I	I	I	I	II	I	II	I	I	I	I	I
4. LESSER	616	I	I	I	I	II	I	II	I	I	I	I	I
5. 85-PA-02	---	I	I	I	I	II	I	II	I	I	I	I	I
6. 85-PA-00	---	I	I	I	I	II	I	II	I	I	I	I	I
7. 85-PA-01	---	I	I	I	I	II	I	II	I	I	I	I	I
8. FRENCHIE	166	I	I	I	I	II	I	II	I	I	I	I	I
9. SCOPER	577	I	I	I	I	II	I	II	I	I	I	I	I
10. CHOP SUEY	118*	I	I	I	I	II	I	II	I	I	I	I	I
11. 043	---	I	I	I	I	II	I	II	I	I	I	I	I
12. 85-PA-03	---	I	I	I	I	II	I	II	I	I	I	I	I
13. LEIGH	236*	I	I	I	I	II	I	II	I	I	I	I	I
14. 387	---	I	I	I	I	II	I	II	I	I	I	I	I
15. BMW	161	I	I	I	I	II	I	II	I	I	I	I	I
16. 581	---	I	I	I	I	II	I	II	I	I	I	I	I
17. 85-PA-04 (COW)	---	I	I	I	I	II	I	II	I	I	I	I	I
18. CALF OF PA-04	---	I	I	I	I	II	I	II	I	I	I	I	I
19. 573	---	I	I	I	I	II	I	II	I	I	I	I	I
20. (COW)	155	I	I	I	I	II	I	II	I	I	I	I	I
21. CALF OF 155	---	I	I	I	I	II	I	II	I	I	I	I	I
22. 530	---	I	I	I	I	II	I	II	I	I	I	I	I
23. 215	---	I	I	I	I	II	I	II	I	I	I	I	I
24. 221*	---	I	I	I	I	II	I	II	I	I	I	I	I
25. 566	---	I	I	I	I	II	I	II	I	I	I	I	I
26. 219	---	I	I	I	I	II	I	II	I	I	I	I	I
27. 85-PA-05	---	I	I	I	I	II	I	II	I	I	I	I	I
28. 584	---	I	I	I	I	II	I	II	I	I	I	I	I
29. 351*	---	I	I	I	I	II	I	II	I	I	I	I	I
30. 85-PA-06	---	I	I	I	I	II	I	II	I	I	I	I	I

KEY: I = Point Adolphus area of Icy Strait

* = Also seen in Glacier Bay during summer 1985.

Table 5
The movement of whales from Glacier Bay - Icy Strait
to Frederick Sound.

ID#	Last Date Sighted Glacier Bay - Icy Strait	First Date Sighted Frederick Sound
1. 043	June 15	August 5
2. 281	June 28	July 11
3. 221	July 17	August 31
4. 85-PA-02	July 24	August 5
5. 155 (cow)	August 8	August 30

Figure 1.
The initial position of humpback whales sighted during
the June, 1985 surveys.

Figure 2.
The initial position of humpback whales sighted during
the July, 1985 surveys.

Figure 3.
The initial position of humpback whales sighted during
the August, 1985 surveys.

Figure 4.
Fathometer recordings made in the path
of a feeding whale, Notchfin, south of Hugh Miller Inlet
on July 7, 1985 (scale 0 - 50 fm).

Figure 5.
Fathometer recordings made in the path
of a feeding whale, White Eyes, in Sitakaday Narrows
on July 17, 1985 (scale 0 - 50 fm).

Figure 6.
Fathometer recordings made in the path
of a feeding whale, Chop Suey, in Berg Bay
on July 21, 1985 (scale 0 - 25 fm).

Figure 7.
Fathometer recordings made in the path
of a feeding whale, 85-GB-03, north of Willoughby
Island on August 25, 1985 (scale 0 - 50 fm).

Figure 8.
Fathometer recordings made in the path
of a feeding whales (pod of four adults) near
Point Adolphus, July 15, 1985 (scale 0 - 50 fm).

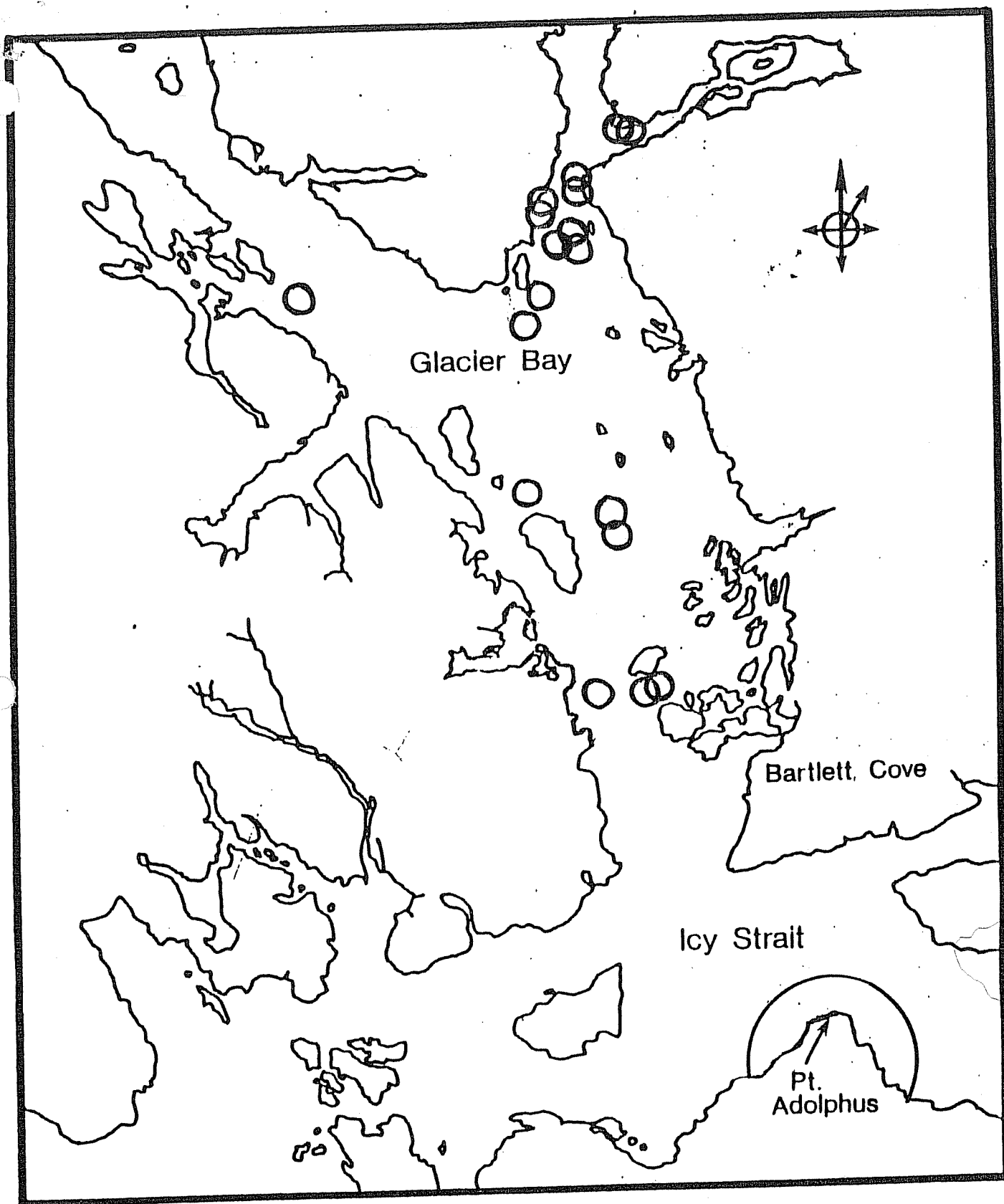


Figure 1.
The initial position of humpback whales sighted during
the June, 1985 surveys.

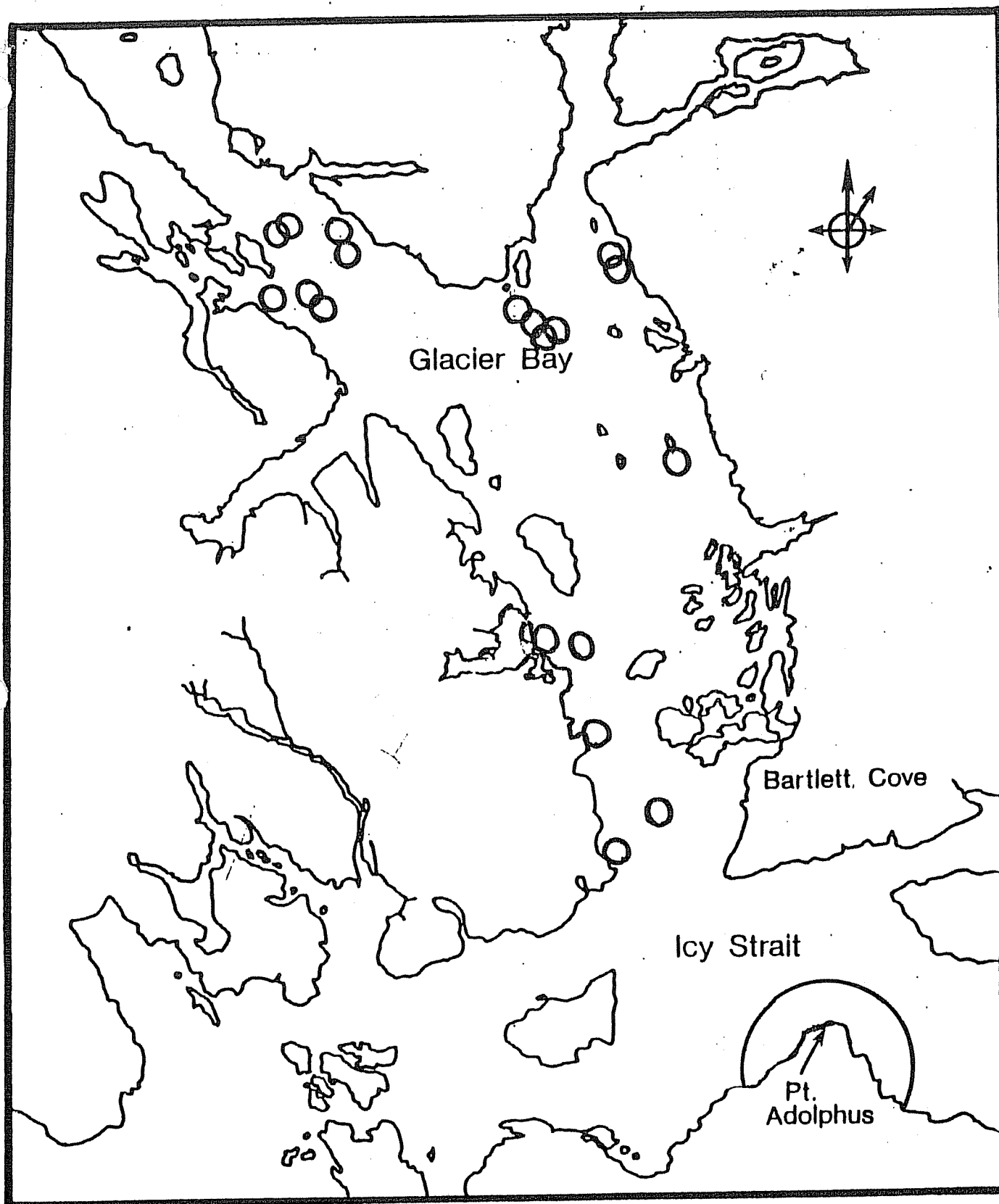


Figure 2.
The initial position of humpback whales sighted during
the July, 1985 surveys.

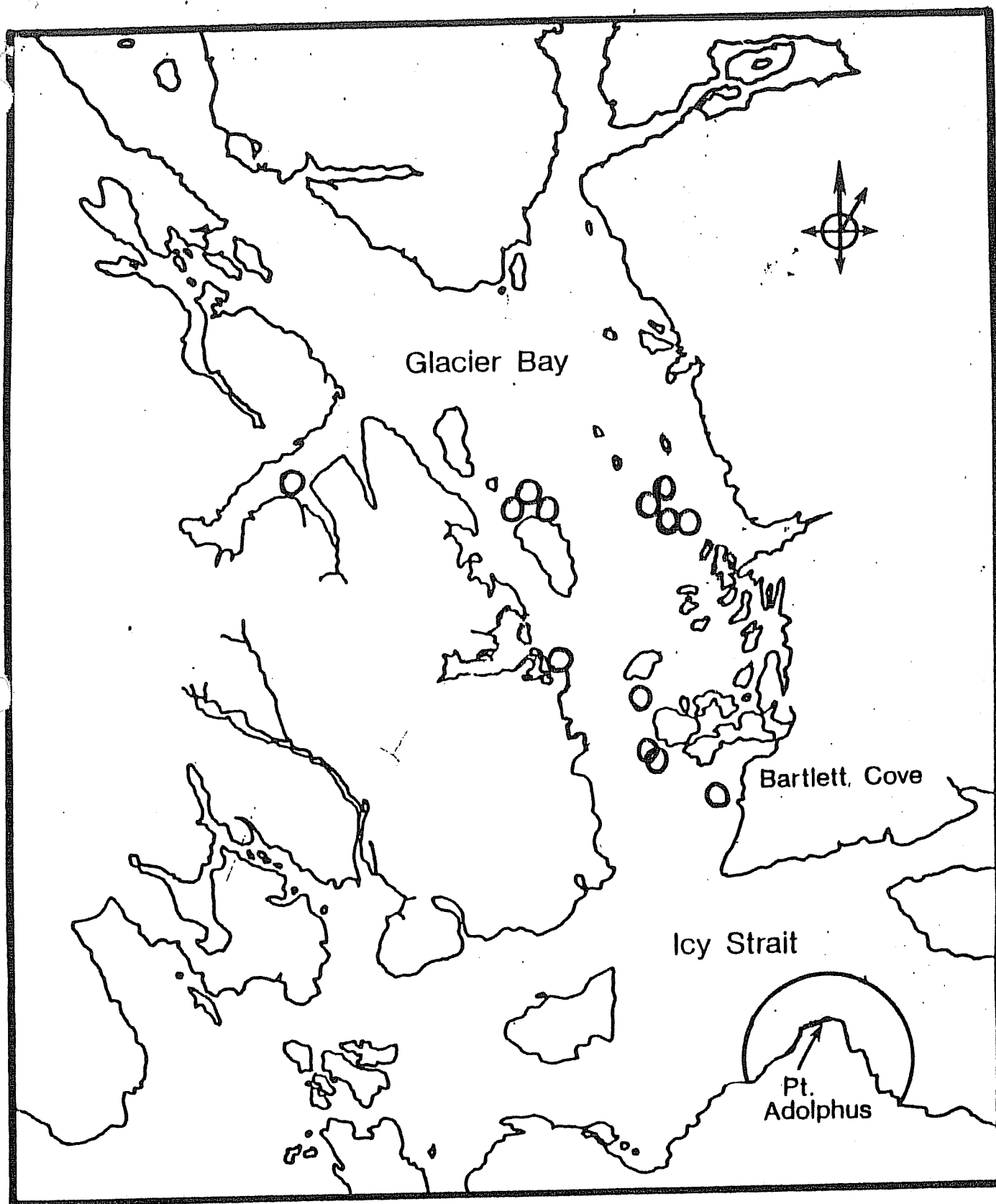
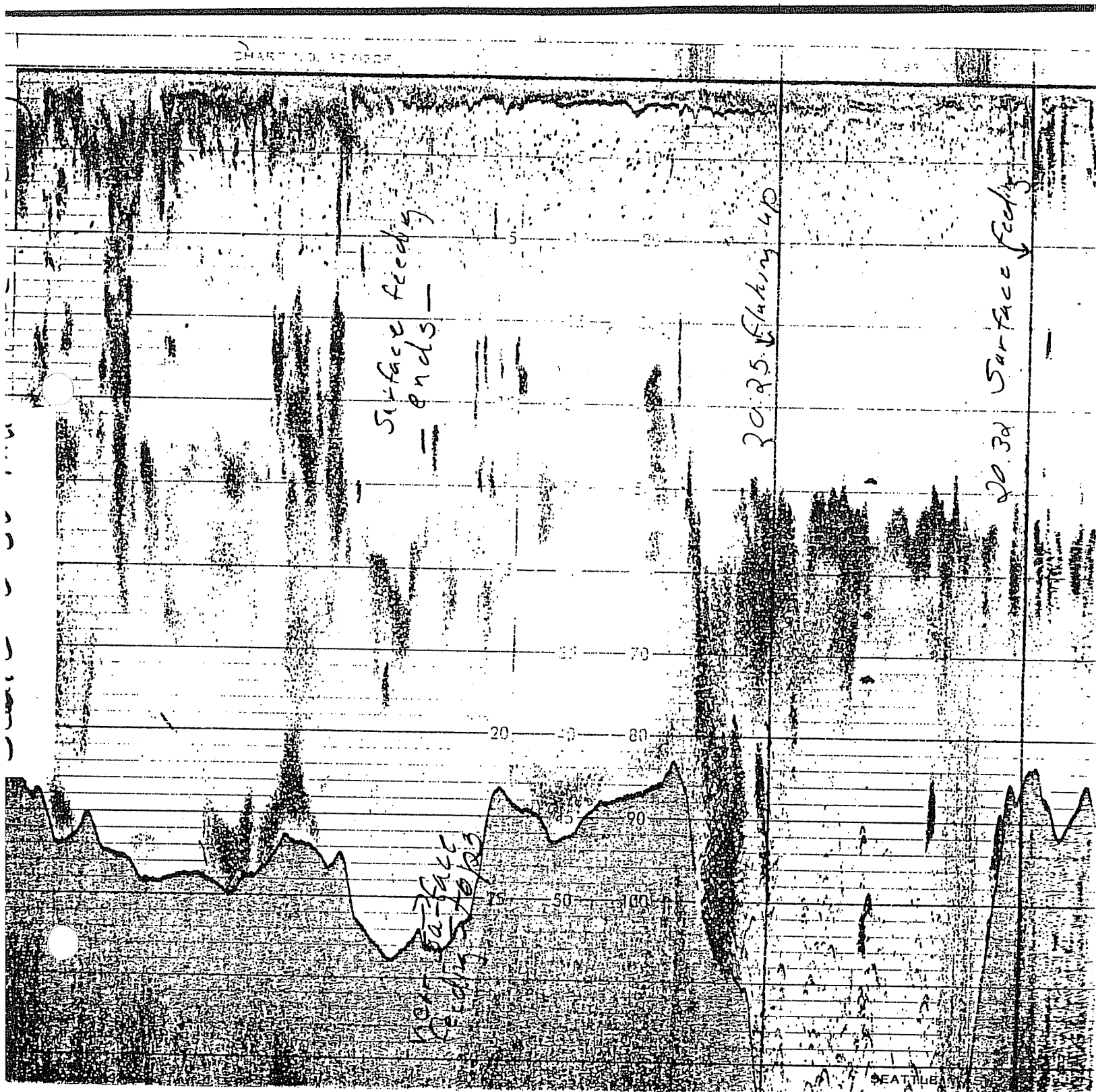


Figure 3.
The initial position of humpback whales sighted during
the August, 1985 surveys.

Figure 4.
 Fathometer recordings made in the path
 of a feeding whale, Notchfin, south of Hugh Miller Inlet
 on July 7, 1985 (scale 0 - 50 fm).



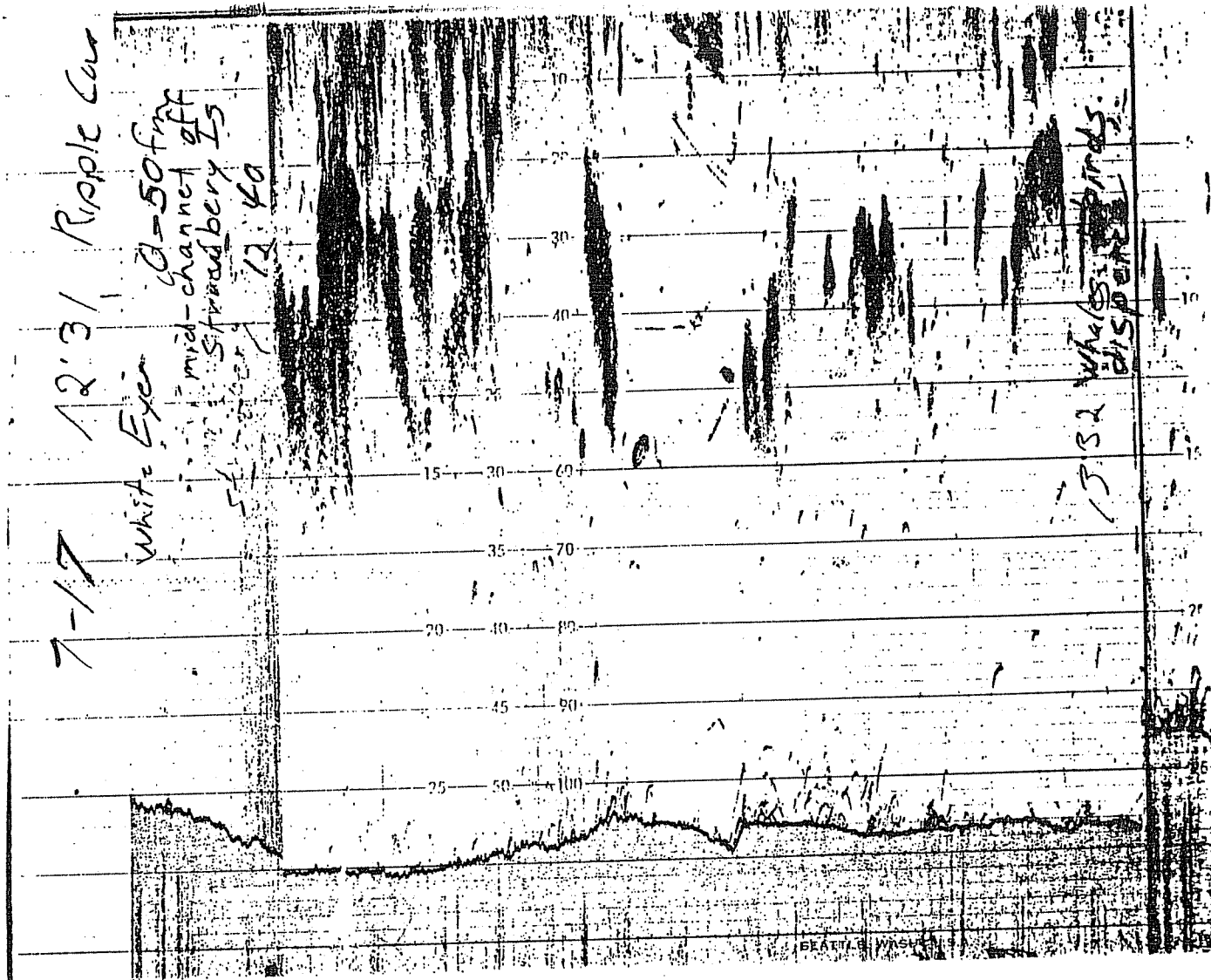


Figure 5.
Fathometer recordings made in the path
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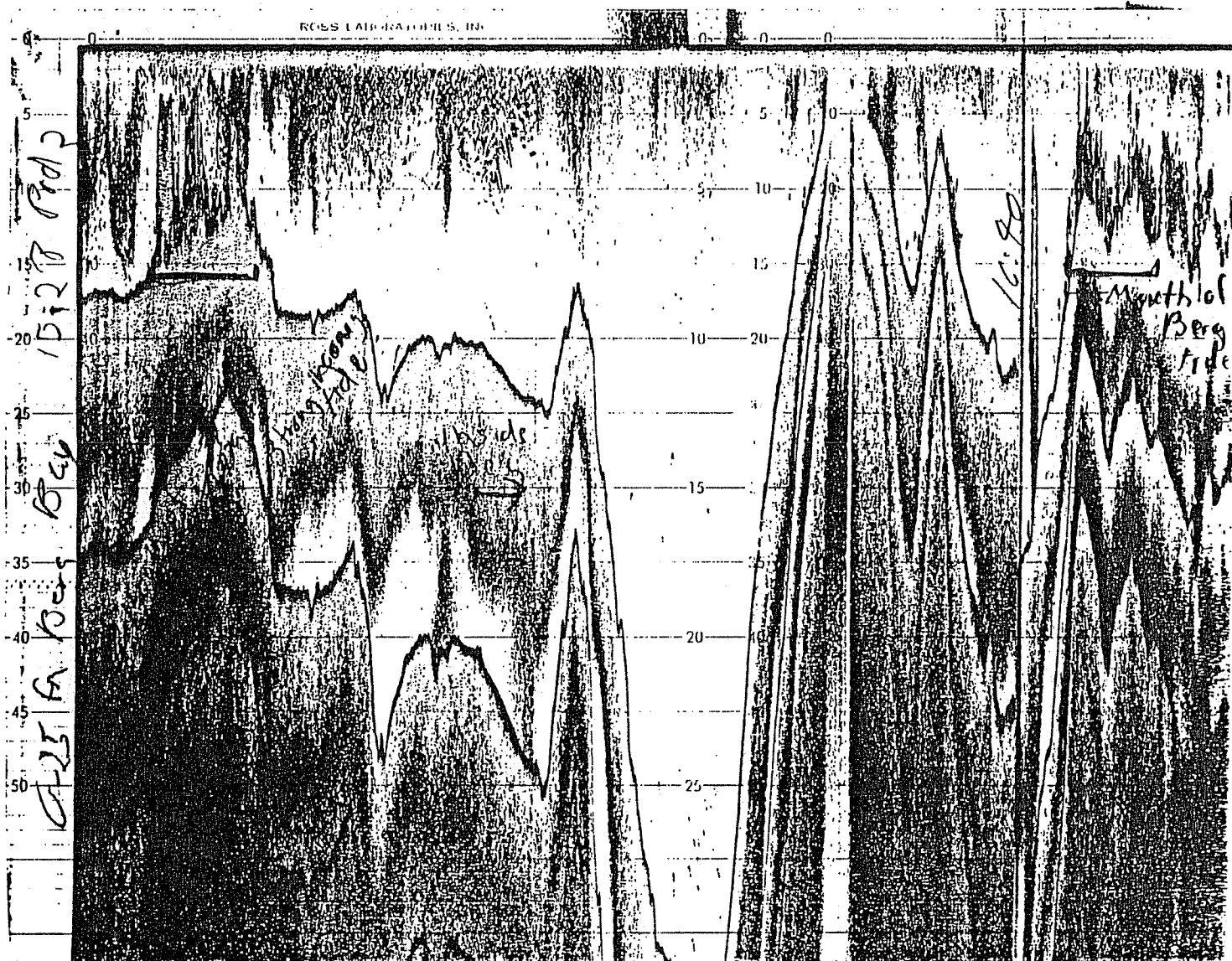
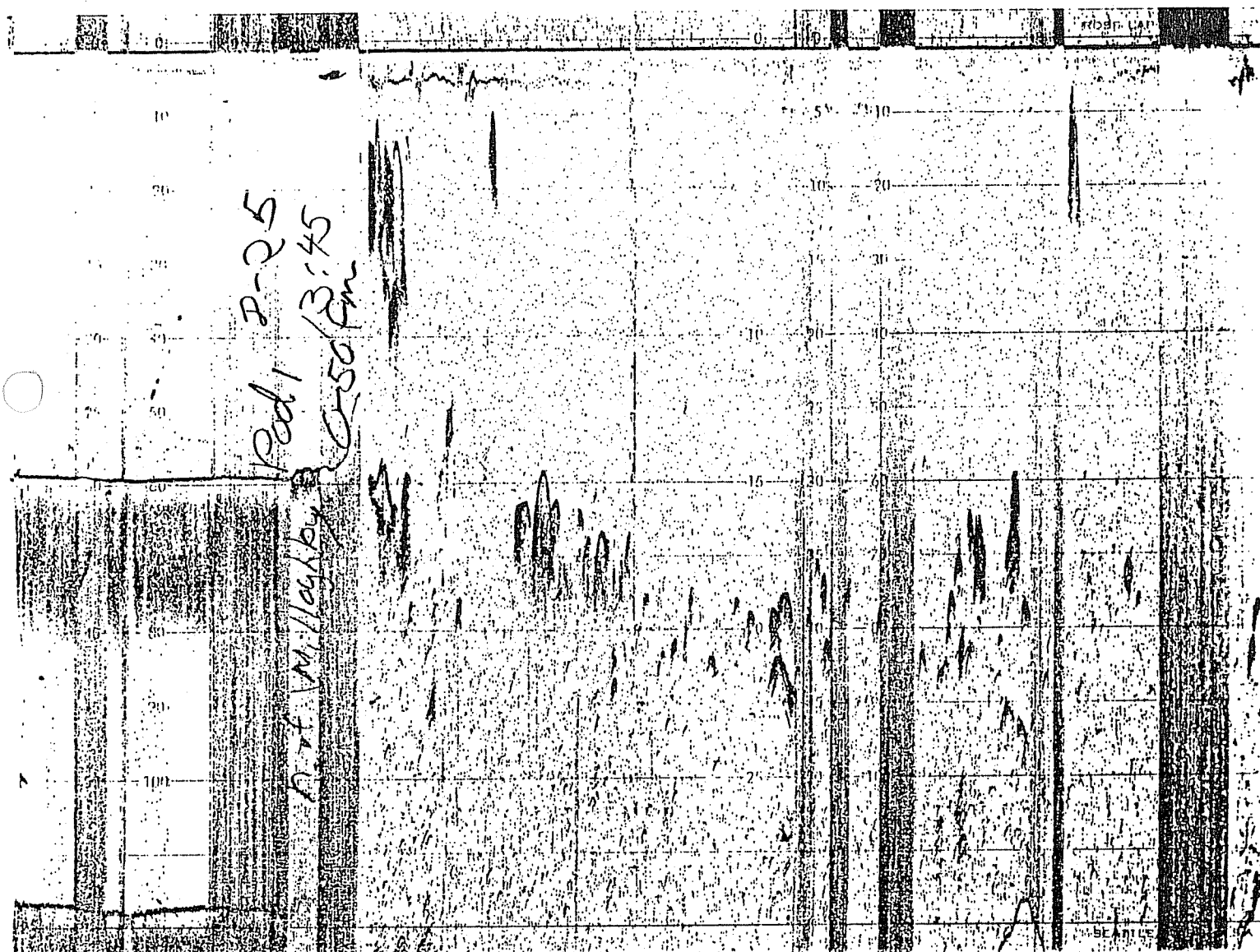


Figure 7.
Fathometer recordings made in the path
of a feeding whale, 85-GB-03, north of Willoughby
Island on August 25, 1985 (scale 0 - 50 fm).



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